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AUTHOR Black, John B.
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ABSTRACT

This outline of new technological developments and their applications in the library and information world considers innovations in three areas: automation, telecommunications, and the publishing industry. There is mention of the growth of online systems, minicomputers, microcomputers, and word processing; the falling costs of automation; the growing use of packet switching and other digital networks, interactive cable television, fiber optics, and electronic mail systems; and the development of electronic publishing, micropublishing, and videodisk publishing. The paper concludes with a brief review of the implications of the new technologies for library services, networks, staff, collections, materials, buildings, and budgets. (ESR)

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NEW INFORMATION TECHNOLOGIES: SOME OBSERVATIONS ON WHAT IS IN STORE FOR LIBRARIES

By

John B. BLACK
Associate Librarian
University of Guelph
GUELPH
Canada

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After looking at the many interesting and exciting new technologies currently appearing on the scene one is quickly drawn to the conclusion that those who are fortunate enough to be in the "Information Business" in these last two decades of the twentieth century are simply incredibly fortunate. We are in the middle of a whole series of technological revolutions that will have tremendous impacts on not only our working lives, but also on many other aspects of our existence. We can be part of "making this happen" by charting the course of how many of these technologies will be used within corporate structures, within educational institutions, within our communities, be they large or small. Alternatively, we can simply sit on the sidelines, wring our hands in fear and trepidation, and let it all pass us by.

What are some of these technologies? What are some of the implications for libraries of all types and for librarians. Social Science libraries and librarians will be affected as will all others. It is rather difficult to segregate these rapidly devleoping technologies and to try to put them into simple, neat categories as, one way or another, they are largely inter-related. One group, which is in a sense "nothing new" but simply an extension of what has been happening for many years, might generally be put under the umbrella "publishing". The other, much larger and much more "spectactular" group is to a large extent dependant on the development of the now ubiquitous "semi-conductor" technology: the transistor and its many successors.

AUTOMATION

A number of trends have been developing in this area during the past few years. Some of the most important for libraries are:

(1) The development of on-line systems: the rapid moves which have taken place in the past four or five years in the development on on-line access to computer systems and away from earlier batch oriented systems. The punch card has gone the way of the dodo and many batch systems can be seen to have outlived their usefulness in terms of costs, responsiveness, and flexibility in comparison with newer on-line systems. On large computing facilities time sharing is the order of the day.

(2) MINICOMPUTERS: have extended the access to computers in a dramatic fashion and have put great quantities of computing power under the immediate, local control of users enabling them seriously to consider applications which would have been beyond their wildest dreams with core "conventional" mainframe machines. In some ways one of the biggest problems today is defining just what is a minicomputer since many of them are far more powerful than the "maxis" of only a few years ago.

(3) MICROCOMPUTERS: this brings us to the next stage in computer hardware development, a stage which is providing a further dramatic broadening of access to computing. Again, we are faced with a definitional problem for one person's micro may be another's mini. It is only the beginning and it is changing every day. Memory is getting cheaper, storage is getting bigger, faster and cheaper, peripheral devices are getting more sophisticated and cheaper. For those of us living in North America or Western Europe the microcomputer revolution is close at hand and fully in evidence in the form of rapidly burgeoning number of retail computer stores springing up even in small towns and cities. In other parts of the world participation in this "revolution" may be more difficult to achieve due to limited availability of equipment, poor equipment distribution networks, foreign exchange limitations and non-existent service infrastructures.

(4) WORD PROCESSING SYSTEMS: If your institution has not yet discovered "word processing" you can be certain it soon will and along with it the rest of the "technology family" of the "Office of the Future" and "Office in a Briefcase" (or whatever the current jargon happens to be). This may well be one of the first exposures that many people in your institution will have to "computers" or "automation" and librarians should be aware of the nature of the possibilities (and limitations) of these systems. One can guarantee that some of you will be faced with the glimmer in a manager's eye as he says --- "well, if we can handle all these complex reports and correspondence files on the word processor something as simple as the library should be a "SNAP". Yes, it may well be a "snap" --- or it may be a trap. At least librarians should be aware of some of the possibilities and be ready to take advantage of the management interest (and perhaps the quick breeding of terminals that may be

taking place around you). A "word processing system" is not a library system, but it may well be the trojan horse that can be used to get automation into a library. At least the current boom in this area has the spill-over effect of increasing the pace of development and availability of technology that can be of use in libraries and information centres.

(5) ECONOMICS OF AUTOMATION: not only is the cost of raw computer power coming down rapidly (and its potential for decentralization thus growing), but other elements of the equation are also changing. You can get far more computer power for your inflation riddled currency unit and also vastly more mass storage and a far greater range, and reliability of peripheral devices. Today you can buy 300 megabytes of disk for approximately $15,000 whereas it was not very long ago you would pay that much (or more) per month to rent that much disk capacity. Good quality CRT terminals now cost less thatn $1,000 (even less in kit form). And the list goes on and on.

Perhaps it is logical to ask "what is new" in all of this. "I've heard it all before". What is new is that all these bits and pieces are starting to come together in ways that facilitate the application of these technologies in all types of libraries and information services. Not only will librarians be able to apply them, but in fact, it will be very difficult for them to avoid either steering their application or having it thrust upon them. Automation has often been seen as primarily "for the big guys," but that is rapidly changing. The technology already lends itself to "library: type applications on a very broad scale. What we have not really seen to date is much "software" designed for what one might term "minimum system". Hopefully, this will change in the near future.

TELECOMMUNICATIONS

Recent developments in telecommunications services and facilities have opened the way for rapid, simple, relatively inexpensive world wide data communications and systems access. In these brief observations I will not attempt to discuss all the developments in this field but will concentrate

on a few that have some particularly direct implications for libraries:

(1) PACKET SWITCHING: By now terms such as EURONET, TELENET, TYMNET, DATAPAC, CYCLADES and many others are familiar to most people in the library and information service field. However, it is not that long ago that remote access to computers and information services was a very expensive and slow business. Today through packet-switching systems such as those mentioned above, there is immediate, inexpensive, distance independent access to systems throughout Canada, the United States, Western Europe and many other areas. Distance doesn't make much difference and telecommunications costs are often now a marginal cost element in the use of remote systems. North America is simply incredibly well served in this area and the situation elsewhere is improving rapidly.

(2) OTHER DIGITAL NETWORKS: Librarians working in corporate, research or educational settings now also may have access to corporate or institutional telecommunications networks that will provide quick and easy information exchange facilities within your corporation or specific research or educational community. Also developing, particularly in the United States, are many new forms of telecommunications networks --- such as A T & T's A C S (Advances Communications Systems), Xerox's XTEN and others.

(3) CABLE TELEVISION: The lowly cable television system (largely designed initially to provide for efficient importation of distant television programs) is being equipped to provide a true broadband communications link into homes and offices across North America. Canada already has the world's greatest penetration of cable television and many of these systems have been (or are being) equipped to provide interactive television (and there is no reason why they can not provide interactive data transmissions). The technology to allow cable television systems to provide a wide range of communications services is here. In many countries there are a few "minor" regulatory hurdles to overcome first.

(4) FIBRE OPTICS: The next development to watch in the telecommunications field is "fibre optics": the development of "cables" composed of

bundles of glass fibre each the size of a human hair. Fibre optics communications links have tremendous carrying capacities, with a bundle the size of a standard co-axial cable having a wide bandwidth of many hundreds of megahertz. With fibre optics "spectrum limitations" and "capacity" arguments become irrelevant --- and these new communications links are made of sand not expensive copper.

(5) ELECTRONIC MAIL: This service is just starting to emerge as a major development. It did not take long for the "computer freaks" using various timesharing and remote access computer systems to begin to send messages to each other, sometimes of a very informal and frivilous nature, and at other times of vital importance. Recently there has been a growing awareness of the possibility of using data communications networks, existing (or new) computing facilities, terminals and combining them into more "user friendly" electronic mail systems. There are still some legal and regulatory hurdles to be overcome, but there is no doubt that we will all be using these services regularly and routinely in the near future.

The combination of telecommunications and automation combine to provide those in the library and information field with opportunities for new and qualitatively different services than we were able to offer before. Most of these services are (or will be) based on remote and distributed access to information and computing facilities. After all, one of the prime functions (if not THE prime function) of most libraries is to be able to provide rapid, thorough and appropriate access to the information desired and need by our clientele, regardless of where the information (or perhaps where the client might be). Through a combination of telecommunications links (especially packet-switched computer networks), automated information retrieval systems, electronic mail and facsimile, librarians in a metropolitan centre or in very remote parts of the world are in a position to gain access to a very wide range of information sources to meet the needs of their clientele. In the same fashion, a small library, a "one-person shop", a free-lance information broker, can all have access to many of the information sources that in times past would have been the sole province of a major research library. Combined

with facsimile transmission (or perhaps more likely with some form of electronic publishing) even the problems of remote document delivery may to a large extent be overcome.

With videotex systems and other interactive uses of cable television a number of applications probably will develop that will have direct impact on the future character of libraries. Already in the United Kingdom there are coin operated PRESTEL terminals appearing in public libraries (also at motorway service centres) and by depositing 20p one can access 200,000+ pages of information present on the PRESTEL system. What will be the effects of this technology and these services on public libraries, for example? It is difficult to forecast. While such systems are unlikely to replace the book, they may substitute for some of the other public information functions of libraries or they may simply provide tools that librarians can use to meet the information needs of their clients more effectively.

PUBLISHING

Most of the observations above have been related to the provision of access to information. It is essential to turn at least briefly to the materials in the library themselves. What is happening and going to happen in what might be broadly defined as "publishing"? Here are some areas to watch:

(1) ELECTRONIC PUBLISHING: Although it has come to mean quite different things to different people there are at least three common usages of the term: (1) materials "published" through systems like TELIDON, PRESTEL, and other videotex systems, (2) materials "published" in digital form such as on magnetic tape, floppy disks and videodisk, and, (3) information created through various word processing, text editing, and photocomposition systems that is then used to produce printed output or may be accessed directly through electronic means. It is the latter type that may well have the most immediate impact on libraries. In the past, most of the major machine readable bibliographic files were initially created as by-products of the photocomposition process, but today some are appearing only available in machine readable form. Gradually some

full text services are becoming available and as the cost of on-line storage continues to decline it will be more feasible to store full text on-line. This presents some interesting possibilities since more and more research papers, journal articles, books and all other types of publications are starting life on electronic text editing systems or word processors. They are written, edited, rewritten and then a final copy is formatted and sent off to the publisher. The text is then re-edited and probably re-input into yet another photocomposition system/word processor/text editor. Technically it is quite possible today (and will become even easier tomorrow) to transmit the article (for example) to the publisher/editor in electronic form, where it is then edited and passed through the photocomposition system. It would be possible to allow reviewers to look at it on-line thus saving considerable time in the reviewing process. Alternatively it could be carried to the logical conclusion and never published but instead simply made available for direct remote access. While I do not see such a system doing away with Scientific American, New Society, the American Economic Review, or many many others, as the costs of conventional publishing (and the time delays present in existing systems) continue to grow, I am certain that this approach will become much more attractive, particularly for many specialized audience publications. Libraries of all types obviously must be preparing to deal with such developments.

(2) MICROPUBLISHING: Is certainly going to be present for a long time to come and a variety of new developments can be expected in this area. Gradually microforms may be starting to lose some of their mystique (libraries are starting to bring microforms out of their basement cages) and are being accepted as a normal, regular information dissemination medium. New technology, especially in the form of new readers and higher quality reader/printers will help make them more attractive to users. Color microforms have been a long time coming, but gradually are creeping into applications where they are appropriate in spite of the fact that they may be more expensive than conventional black and white microreproductions. Computer generated microforms are also likely to loom much larger on the horizon for many libraries. This will be not just for COM (Computer Output Microform) catalogues (which are

largely an interim step on the road to on-line catalogues), but, more importantly, for substantive materials that will be produced directly from machine readable files. For example, a specialized journal that can no longer be economically published by conventional printing means might be produced from machine-readable text files direct to microform.

(3) AUDIO-VISUAL MATERIALS: With videotape recording becoming commonplace and videodisk finally appearing on the scene (after several false starts) most libraries will be increasingly involved in providing access to these materials. This is based on the assumption that librarians really do view themselves as purveyors of information and not custodians of old books and journals. In the special library environment, many corporate libraries have included audio decks, slide/tape units and videotape players within the library, particularly for use with company training materials. This same equipment obviously has the potential for much wider use as well. Watch for videodisks as it is certain we will see and hear a great deal more about them in the near future. The feasibility of being able to distribute a major motion picture for $15-$25 opens up many possibilities. At the same time, it is also important to remember that the same RCA/PHILLIPS videodisk can also hold 54,000 video pages of data (approximately 20,000 pages) and that once you get a master, the pressing cost of the copies in quantity 1000 is in the order of 50 cents.

Rather than attempting to outline other specific technological applications it is appropriate to summarize some of the primary implications fro libraries in the technologies now on the scene:

(1) Services: The developing technologies will enable libraries to offer all their clients types of services which could not have been considered in the past. They will also enable libraries to continue to provide basic services even in time of great fiscal "restraint", a particularly critical factor for small libraries.

(2) Networks: Many of our concepts of what constitutes a "network" will have to be revised in the light of the new technologies now available and coming "on stream". In particular, it is much easier to contemplate

distributed network environments rather than the classic star networks. What the technologies of the 70's made possible in terms of star network development, the technologies of the 80's will render redundant.

(3) Staff: Most libraries will probably have small staff complements in the future but they will require a different "level" and "type" of staff, both professional and non professional. Not just the fact that they will need to be able to cope with the new technologies, but, more critically, they will need the ability and desire to cope with constant change and situations that demand imagination, creative thinking, what might best be described as flair.

(4) Collections and Materials: Librarians will have to cope with new forms of materials and new means of storage (data files, videotapes, videodisks, color microfiche, etc.).

(5) Buidlings: Libraries will become less warehouses for printed materials and more active switching centres for information transfer. Already in North America, one can see that the role of the "information centre" now has the potential for considerable expansion to take it far beyond its traditional role. Thus many past notions of what constitutes a "good building" will have to be revised in light of the new equipment that will be used and services that will be provided. The need for power and communications conduits, flexible layouts, and general flexibility will become critical.

(6) Budgets: It is likely that money will be tight for libraries of all times and in virtually all nations. Librarians will have many tough battles to face in order to get the capital and operating support they need to implement many of these technological changes. However, if they understand the nature of the technologies and can realistically evaluate their application in their particular setting, then the chances are very good that they will be successful in building the necessary support to get on with the job.

All in all it is an exciting time to be in the library and information profession. This is the case regardless of the type, size or location of the service one is involved in. For those interested in Social Science libraries

the times may be even more exciting than for others since many of the technological developments can be seen to have immediate impact. Increased access to numeric data, greater availability of full text retrieval and manipulation systems, audio-visual materials for teaching and research purposes, all have direct, immediate application in Social Science libraries. Understanding the nature of the technologies and their possibilities is certainly a challenge, but the opportunities are there to be grasped.